

and 0.32. The results indicated that the aggregate was the dominant variable. They concluded that, “For high strength concrete, the strength of the paste and paste aggregate interface are sufficiently increased such that the strength becomes limited by failure of the aggregate.”

HPC is beneficial in nearly every aspect. Across the United States, it has been found that obtaining the longer life and increased durability of bridges built with HPC can come at no additional initial cost. Mary Lou Ralls of the Texas DOT notes that, “Although HPC mixes cost more than conventional mixes, overall bridge costs can be lower because fewer beams and supports are needed” (Halkyard 1996).

1.4 Literature Review: High Performance Bridges

Since the increasing cost of materials can be offset by an increase in strength and a corresponding reduction in material quantities, high performance structures are becoming increasingly popular (Price et al. 1999). This discussion is not intended to list all bridges constructed using HPC, but to highlight some important structures which exemplify the use of HPC in bridge structures.

In 1973, the first generation of HSC bridges was built for the Japan National Railway. The second Ayaragigawa Bridge used post-tensioned bulb T-beams with 8,600 psi (60 MPa) concrete. The Iwahana Bridge was a single span Warren truss made with over 11,500 psi (80 MPa) concrete. The Otanabe Bridge was a single span Howe truss built with a HSC mix of the same strength. These historically significant bridges utilized HSC in order to lower dead load, reduce deflection and reduce vibration and noise (Zia et al. 1997). Since their construction, these bridges have performed to all expectations.